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CONTAINERIZATION OF SPRATS

Trials, 1983 season

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Containerization of sprats

Trials, 1983 season

Project leader: Andreas Ostebrot

Introduction

During the 1982 sprat season, introductory trials were carried out with transportation of fresh sprat in insulated containers by the CSW principle. The results were promising, and therefore it was decided that a bigger experiment be carried out with containerized transport to three sardine plants in the 1983 sprat season.

The aim of these trials was to solve a number of practical problems connected with loading and unloading and to study whether the raw material quality would be satisfactory.

Layout of trials

Two boats were furnished with receiving equipment for brailing directly from the seine and weighing in the brail, as well as with receiving bins with outlets in the bottom, and a measure for measuring fish into containers. Icing was performed manually with shovels.

Containerized raw material was delivered throughout the season to three plants. The production took place by the usual methods, and inspection was performed by the Inspection Institute of the Canning Industry (HK) by standard criteria.

An observer participated in 6 expeditions during the season.

Summary and conclusions

Three plants produced a total of about 29 500 cases of sardines from containerized sprat during the season in question.

The quality was distributed as follows: 71.1% A-rated goods, 22.3% A-rated goods, 5.1% A-rated goods, and 1.5% (461 cs) D-goods (unfit for consumption). A high content of histamine (200-270 mg histamine/kg) was found in a lot evaluated as A. The D-lots and the lot with the high histamine content were manufactured from a load with containers filled with too much fish in relation to ice, which resulted in insufficient chilling of the raw material.

The hauling procedures and the handling of fish at the plants can be corrected and performed without the mentioned type of damage. It is worth mention that the gills of containerized sprat do not become red in the same way as do those of boxed sprat. Therefore, evaluation of raw material quality must be performed with special care.

It is also reported that containerized raw material not completely bait-free has a tendency to leak more from the vent than boxed material.

The three plants produced during the season 4 615 cases using raw material parallelly transported in boxes, with the quality distribution 69.3% A-goods, 16.8% A-goods, and 13.9% A-goods.

Excluding the fish that did not become chilled because the containers were not correctly filled, containerization of sprat in 1983 did not result in a true or demonstrable reduction in the quality of the finished product, compared with boxed raw material.

Containerization of sprat resulted in essential savings in the work load of the fishermen, the transporting crew, and the sardine producers. Therefore, it can be concluded that containerization is a feasible and rational alternative to boxing, provided that the related procedures are carried out in a satisfactory manner.

A change-over to containerization requires, i.a., that:

a) The transporting vessels are equipped with a mechanical and rational measuring device for filling the containers, to obtain:
   - equal amount of fish in each container,
   - correct amount of ice in relation to fish,
   - correct distribution of ice/fish in the container.
b) The plants are equipped with acceptable emptying systems;
   - Emptying through the bunghole by water-hosing is disadvantageous;
   - The raw material must be kept at a low temperature as long as possible.
c) The plants develop routines for thorough washing of used containers;
   - internal and external washing and disinfection followed by high-pressure rinsing.
d) A satisfactory control system is developed for:
   - improved distribution of raw material,
   - temperature measurements, and
   - improved evaluation of raw material quality.

Handling during hauling and at plant

Hauling

An observer participated during the season in 6 expeditions, which corresponded to 17 seine-fulls (hauls) or a total of 8 100 "bushels". The table below shows

hauling time, hauling rate , manning of hold, manning of deck, and number of fishermen.

Observations during hauling of sprat for containers

The hauling rate was on average 247 "bushels"*) per hour. This is somewhat low in comparis on with the expectations for container use. The table indicates that three men in the hold are required for rational handling. Also, two men on the deck seem to be sufficient.

Hauling of sprat for containerization

Size of haul	Time from start of haul until all fish containerized	Bushels/ hour	No. of men: Hold	Deck	Haul
268 bushels	0.42 hrs	25[illegible]	4	[illegible]	[illegible]
940 "	5.67	16[illegible]	4	2	[illegible]
544 "	1.92	28[illegible]	4	[illegible]	[illegible]
136 "	0.17	29[illegible]	[illegible]	[illegible]	4
586 "	2.0[illegible]	29[illegible]	[illegible]	[illegible]	4
687 "	2.2[illegible]	30[illegible]	[illegible]	[illegible]	[illegible]
411 "	2.8[illegible]	14[illegible]	[illegible]	[illegible]	[illegible]
442 "	2.0[illegible]	21[illegible]	[illegible]	4	7
843 "	3.6[illegible]	230	3	2	6
340 "	0.9[illegible]	370	4	4	5
186 "	0.75	250	2	2	[illegible]
482 "	2.5[illegible]	193	2	2	4
707 "	2.4[illegible]	293	4	3	[illegible]
643 "	2.7[illegible]	231	3	2	[illegible]
260 "	0.8[illegible]	294	2	2	7
125 "	0.83	150	2	2	

The hauling rate was restricted by the handling of filled containers. The latter was more labor-intensive and time-consuming than had been assumed. It would be more rational if one person filled the containers, aided by the equipment measuring the fish, ice, and water, and two persons fetched the

*) The Norwegian "bushel" (skjeppe) is about 20 L, as against the British bushel of about 36 L. (Translator's note)

filled containers to bring them to the hold. An improved system should be able to handle 400 to 500 bushels per hour, with essential reductions in the work load in comparison with the system tried this year.

Unloading

The table below shows unloading time per plant.

There were great variations in content of sprat per container.

The average unloading rate was about 1 400 bushels per hour by unloading of containers alone.

Three lots, consisting of both containers and boxes, were observed. On the basis of an unloading rate of 1 400 bushels/hour with containers, the unloading rate of boxes can be assumed to be 450 bushels/hour. Thus, unloading containers results in a time saving of 60-70% in relation to boxes. Unloading containers only was carried out without participation by the crew of the receiving plant. When boxes are unloaded, at least one person from the plant participates in the work by driving the boxes to the cold storage. This is usually done in the evening and means 3 hours overtime at 100%. With five deliveries per week, this corresponds to about 30 hours, or 3/4 of a week's work.

Further, boxed sprat requires two workers for feeding the raw material to the production and washing the boxes. It is reported by the management that when containers are used, one person is required for feeding the raw material and washing the containers.

Thus, containers result in a reduction of about 1.75 day's work per production day. 0.75 of this consists of directly reduced operating costs, while the

remaining one day's work means an opportunity to relocate a person during the fresh-fish season.

The containers were emptied in the plant by opening the bunghole and hosing with water. This is practical but means that the raw material is subjected to a considerable temperature rise before it arrives at the machine. This way, some of the positive effect of the container is lost.

Unloading of containerized sprat

Date	No. of containers	Barrels	Ash. cont.	Unloading time	Unloading bsh/hr
24.07	15	450	30	0.2[illegible]	158[illegible]
25.07	11	330	30	0.30	110[illegible]
25.07	13	390	30	0.25	156[illegible]
26.07	16	400	25	0.27	150[illegible]
27.07	6	125	21	0.12	1070
27.07	21	500	24	0.37	1363
04.08	15	384	26	0.48	795
04.08	17	435	26	0,50	870
04.08	12	307	26	0,32	970
08.08	13	400	31	0,25	1600
08.08	15	420	28	0,28	1480
08.08	18	575	32	0,30	1916
11.08	6	247 *	24,5	0,42	826
12.08	10	245 *	24,5	0,41	841
12.08	13	385 *	30	0,47	1032
19.08	9	281	31	0,15	1873
19.08	9	253	28	0,12	2170

The receiving plants, should install rational draining and emptying devices for future containerized operations.

Used containers were washed by high-pressure spraying. However, containers with a foul internal odor were found once. Otherwise, a trend towards poor external washing was observed. A future use of containers requires a permanent routine for external and internal disinfection and high-pressure spraying at all plants.

Guidelines for use/filling of containers

General

The container (CIPAX type 3532) has an interior volume of 750 L. Seventy percent of the volume can normally be used for fish, which means about 525 kg of fish. The quantity of ice added must chill the fish to $0^{\circ}C$ and be sufficient to prevent a rise in temperature during transport and storage. It is absolutely critical for containerization that fish and ice are so well mixed that all fish is rapidly chilled. After the container is filled with fish/ice, ice-chilled seawater is added, so that the fish and ice mixture "floats", and pressure and consequent damage are avoided. It is important that the containers are thoroughly cleaned at the plant to prevent bacterial growth as much as possible. Dirty or foul-smelling containers must not be used. Receipt of such containers is to be reported immediately to the raw material office of Norway Foods.

Quantity of fish, ice, and water

A full container is to hold 500 kg of sprats. The measure of the filling device is designed to hold 50 kg. Thus, the measure has to be filled ten times to fill the container. Enough ice is added after each emptying of the measure to cover the whole surface. The ice quantity required is actually dependent on the fish temperature and the external temperature at the time of storing the containers. A simple and standardized routine can be based on the following assumptions:

Maximum fish temperature: $20^{\circ}C$
Average storing temperature: $20^{\circ}C$
Longest time between haul and production: 36 hours

Thus, the quantity of ice required is:

1) Chilling of fish from 20° to 0°C	- 95 kg
2) Loss during storing	- 30 kg
Total ice quantity	- 125 kg

The density of ice is 0.5 kg/L so that 125 kg corresponds to 250 L ice.

Thus, the containers must be filled with 500 kg of fish and 250 L of ice. (If the fish temperature is above 20°C, the ice quantity must be increased and the fish quantity decreased). The amount of water added is dependent on the fish temperature. If the fish temperature is high, e.g. around 20°C, a lot of the ice will melt during the filling. Melted ice takes up only half of the volume of ice. A container with 500 kg fish and 250 L ice will thus seem to be less full, and almost 150 L of ice-water will be required. If the fish temperature is low, e.g. 10°C, much less ice melts during the filling, and only about 50 L of ice-water may be needed. What is important is not the quantity of the ice-water added but that enough is added to fill the container up to the lid. The ice-water is prepared beforehand in other containers. If the upper temperature limit of seawater is assumed to be 20°C, 250 L of ice will cool 500 L of water to 0°C.

Filling instructions

1. Preparation of chilled seawater

Place 250 L of ice in the bottom of each container. The ice has a depth of about 25 cm measured from the bottom. The containers are filled up all the way to the rim with seawater. Prepare enough chilled water to cover the needs of a haul. One container-full of icewater should be sufficient for 6 - 10 containers.

2. Filling of containers

a) Check that the bunghole is closed.

b) Add 30 L of ice in the bottom.

Thirty litres of ice has an approximate depth of 3 cm when the ice layer is even. As a normal ice shovel takes 7 - 8 L, four shovel-fulls are required. Measure the shovel and determine how many are needed.

c) Add 20 L of ice, evenly distributed over the sprat.

e) Repeat measures c) and d) until the container has 500 kg of sprat.

f) Fill up to the top with ice, seeing to it that the lid can close without pressing the fish.

g) Fill the container with icewater until the level of the water reaches the bottom of the lid. This can be done by filling through the hole in the lid. If this is difficult, the water can be added before the lid is closed.